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"LONG-STINGS."

BY W. HAGUE HARRINGTON, OTTAWA, ONT.

Among the conspicuous insects which attract the attention of even non-entomologists, there are few more interesting in their structure and habits, as well as in their relations to other groups, than the large "long-sting" ichneumons with their long triple "tails." Our two largest species belong to the genus *Rhyssa* (of the Hymenoptera), and as, so far as I am aware, no accounts of them have yet been published in the *ENTOMOLOGIST*, a brief description of their appearance and habits may not be undesirable.

They may be easily distinguished from their relatives (often their victims), the "horn-tails"—Uroceridæ—as they are much more slender in body and appendages. The female, readily determined by the extraordinary development of the ovipositor, has the abdomen stouter than that of the male, with the posterior segments dilated and curved under, and bearing the ovipositor, which is constructed essentially of the same parts as is that of a "horn-tail," only that they are greatly lengthened.

The head, in shape like a short segment of a cylinder, slightly convex before and concave behind, bears on its rounded front a pair of large eyes, from between which spring the long slender antennæ. The head is joined by a small neck to the thorax, which is strongly built and supports two pairs of long narrow wings, as well as the six very long and slim, yet strong, legs. The segment of the abdomen which adjoins the thorax is much less in diameter than the succeeding ones.

The male has a long cylindrical abdomen tapering gradually to the extremity. This, in connection with the prominent head and narrow wings, gives him, especially when in flight, a considerable resemblance to a dragon-fly, from which, however, he is at once distinguished by his long antennæ and shorter hinder wings.

In these insects, as in the Uroceridæ, the hinder-wing has upon its anterior margin a row of minute hooks with which to hold the posterior border of the front one. The number of the hooks is, however, much less, there being only about a dozen scattered along the outer half of the wing.

Of our two species the larger and handsomer is *R. atrata*, of which my specimens vary in length from a little over one and one-quarter inches to nearly two. The head is a rich yellow, with the exception of the eyes and a slight band, bearing the ocelli, on the vertex. The slender antennæ, about an inch long, are also yellow, as, likewise, are the extremely long legs, with the exception of the upper joints of the posterior pairs. The thorax and abdomen are black. The wings, which expand from two to two and three-quarter inches, are transparent, but with a dark smoky tinge. The female is furnished with an ovipositor from *four to five and one-half inches in length*; flattened and scarcely stouter than a hair.

R. lunator is more common, at least in this vicinity, and varies much more in size, the largest specimens being fully twice as big as the lesser ones. The body varies in length from three-quarters of an inch to one and one-half inches, and bears at its posterior extremity an ovipositor projecting from one and one-half to three and three-quarter inches.

The head is yellow with a dark band, in which are inserted the three ocelli, between the eyes, parallel to which runs another dark line which almost encircles the head. Lines also run from the base of the antennæ to the mandibles. The slender antennæ are dark at the base but get lighter toward the tip. The thorax and abdomen are dark brown, ornamented with lines and borders of yellow, which is also the color of the legs. The wings (front pair) expand from one and one-quarter to two and one-half inches, and have a quadrangular dark patch on the anterior border.

The larvæ of both "long-stings" feed upon those of the Uroceridæ and other wood-borers, in which the female ichneumon deposits her eggs by means of the long ovipositor. The method of performing this operation may often be witnessed during the summer by visiting beech trees in which Tremex larvæ are at work, but it is difficult to describe clearly its accomplishment and the different postures of the insect during the progress of her laborious and dangerous duty. A series of good drawings would best convey a correct idea of the process, but I do not know of any book in which such are to be found, while some illustrations are very inaccurate. For instance, I saw the other day in a text book of zoology

an ichneumon depicted with her ovipositor fully inserted in the tree and with the *side-pieces or sheaths sticking straight out behind her*. Such an attitude is altogether unnatural, and I am convinced that in that position she would be powerless to extract the ovipositor.

Selecting a suitable tree, if we find no ichneumons at work, we may shortly see one flying strongly and noisily through the sunny woods and settling upon the bark where perforations mark the exits of previous occupants. Here she runs around until she finds a promising spot, as, for instance, the hole made by a Tremex in depositing her egg. Placing herself so that the tip of her abdomen will be above the orifice to be probed, she makes herself as tall as possible, and, by elevating her abdomen and curving under the ovipositor, succeeds in inserting the tip of the latter in the hole.

If the dorsal surface of the abdomen be examined, there will be observed, between the sixth and seventh segments, a gap closed by a whitish membrane. This marks an admirable contrivance to enable the insect to use her seemingly unwieldy weapon, for the membrane is capable of being so dilated as to form a cavity in the posterior part of the abdomen, in which can be coiled a large portion (more than one-third) of the ovipositor, which thus becomes perpendicular under the insect, where it is guided and supported by the sheaths which bend up in loops over her back. By vigorous muscular contractions of the sac, the delicate ovipositor is slowly forced down the larva's burrow, often to its full extent. If a larva be reached an egg is deposited in it, and the ovipositor is slowly withdrawn in a similar manner. This, however, the insect is frequently unable to accomplish, and remains struggling until some bird or tree-toad snaps her up, or she perishes from exhaustion.

I have seen a large *R. atrata* with her ovipositor (five and one-quarter inches long) inserted four and one-half inches into a beech, so firmly that it was only by careful and vigorous pulling that I extracted it uninjured.

The insects are to be found during the latter part of the summer; *R. lunator*, as already mentioned, being much the more abundant.

On the last day of June, 1879, while collecting in a grove just beyond Rideau Hall, I stopped to examine a dead tree for bark and fungi beetles, and was bottling a fine *Penthe pimelia*, when the rustling of insect wings above me attracted my attention. Looking up I saw several specimens of *lunator* flying about the trunk, and a circuit of the tree with closer inspection showed many others walking about on the bark or in various

stages of the act of ovipositing. The tree was a large one, about two feet in diameter, from which the top had been broken off at a height of thirty or forty feet. The rugged bark was dotted all over with *lunators*, often massed in rows or patches, so that there must have been several hundred upon the tree, forming an unusual and most interesting spectacle. The great majority were females, but a number of males were also present. While I was consigning to my bottle a few specimens, a large woodpecker settled upon the opposite side of the tree and began to rapidly thin the ranks of the helpless insects, whose mission, like that of the woodpecker, is the destruction of wood-boring larvae.

A year later, being in the same locality, I visited this tree and found again a number of ichneumons engaged in the performance of their duty, and also saw sticking out of the bark many ovipositors which had belonged to unfortunate visitors of the previous summer.

DESCRIPTION OF THE PREPARATORY STAGES OF DEBIS PORTLANDIA, FABR.

BY W. H. EDWARDS, COALBURGH, W. VA.

EGG.—Obovoid, the base a little flattened, and under the middle thereof is a slight rounded protuberance of lesser diameter; surface smooth; color greenish-white. Duration of this stage 4 to 6 days.

YOUNG LARVA.—Length .13 inch; cylindrical; head twice as broad as any other segment, body tapering slightly from 2 to 13; each segment from 3 to 12 several times creased, making 6 flat ridges, of which the foremost one is broadest, and on this and the fifth ridge each is a minute tubercle and rather long white hair, bent forward, the whole series forming two subdorsal rows, one a little below the other, from 3 to 13; on the middle of side a similar row, one hair to each segment and placed on the second ridge, all of them bent forward; lower down a third series, one to each segment, placed on the fourth ridge, all bent down and back; two short hairs over each pro-leg; on segment 2 are four long hairs on each side, nearly in line, two being subdorsal, the others lateral; on 13 are four hairs in cross row, all curved back, and one on either side behind these; this segment is roundly excavated at extremity, making on either

side a sharp point, which sends back a straight hair; color of body whitish-yellow, in a few hours changing to pale green; head sub-globose, flattened and depressed at top, broadest at base, a little broader than high, the vertices rounded, and on each a slight protuberance, with long curved hair; a similar hair a little below and nearer the suture, and two rows of shorter hairs across face, four in upper, six in lower row; surface corrugated; color yellow, somewhat brown-tinted. Two days later, as the body was changing to green, the head changed to yellow-green. Duration of this stage 6 to 8 days.

After 1st Moulting.—Length .26 inch; cylindrical, tapering from 2 and ending in two long, slender, blunt-tipped tails; color of body bright green; much covered with whitish tubercles mostly arranged in longitudinal rows, one being on either side the medio-dorsal line, one sub-dorsal, one infra-stigmatal, and in the intervening spaces are many separated tubercles; each tubercle ends in a short, stiff white hair; under side, legs and pro-legs green; head obovoid, truncated, well rounded on front and sides, depressed at top, the vertices rather high, each bearing a tapering, roughly tuberculated process or horn, which is green with red tip; the face much covered with white, conical, separated tubercles, arranged in vertical rows; ocelli black; color of head green, rather darker than body. To next moult 7 to 8 days.

After 2nd Moulting. Length .44 inch; shape as at second stage; color light green; the tubercles of the subdorsal line more prominent, more yellow, and run from horns to tails; another such row along basal ridge; head shaped as before, bright green, the horns long, tapering, green with red tips. To next moult 9 to 15 days, depending on the weather.

After 3rd Moulting.—Length .52 inch; shape and color as at preceding stage. To next moult 6 days, in case of a single larva which died soon after the moult. All others have hibernated in stage following 3rd moult.

After 4th Moulting, in Spring.—Length .6 inch; color yellow-green; in addition to the dark green medio-dorsal stripe is another sub-dorsal, and a second on mid-side, both narrow, scarcely more than lines. In 11 to 20 days the larvæ reached 5th moult.

After 5th Moulting.—Length 1 inch, greatest breadth at segments 2 and 3, .13-.100 inch, then tapering to extremity; color as before. In about ten days the larvæ reached maturity.

MATURE LARVA.—Length ♂, 1.2 inch, greatest breadth (in middle segments) .16 inch; ♀ 1.4 in., gr. br. .17 inch; the dorsum much arched and sloping about equally either way from middle segments; ending in two small, short and slender tails; each segment several times creased, the front ridge so caused flattened and about twice as broad as any other, the others equal and rounded; covered with fine whitish tubercles, mostly disposed in longitudinal rows, each bearing a short stiff hair; color yellow-green; on middle of dorsum a dark green band; on the edge of dorsal area a yellow line to tail, and on upper side of this a dark green line; another such on middle of side; along base a narrow yellow stripe; tails pink-tipped; under side, feet and legs pale green; head obovoid, well rounded on front and sides, the vertices high, each bearing a stout tapering process or horn, tuberculated; color yellow-green, the upper part of horns red; the sides of face bear many rather large, white, conical and separated tubercles, disposed in oblique rows; ocelli brown; in one position the largest is green with a brown rim, at other angles it is brown. From 5th moult to pupation 15 to 16 days.

CHRYsalIS.—Length .6 in.; greatest breadth, across base of wings .22, across abdomen .22 inch; cylindrical, the abdomen conical, the wing cases considerably raised along dorsal side; the head case short bevelled transversely to a sharp edge, roundly excavated on the sides, the top rather broad, very little incurved, the corners sharp but not produced; mesonotum prominent, angular, the apex rounded, carinated, the sides flat and sloping; color delicate green, sometimes blue-green, the ventral side of abdomen lighter or whitish; the top of head case and edges of wing cases next dorsum cream color; surface smooth, glossy. Duration of this stage 13 to 14 days.

The chrysalis much resembles that of *Satyrus Alope*; the head case is broader, sharper-edged, the mesonotum more angular and more prominent, and the abdomen more protuberant on the dorsal side; the surface is also smooth, with no granulations.

The caterpillar also somewhat resembles that of *Satyrus Alope*, much more than it resembles any of our species of *Neonympha*, except that the head bears a pair of horns or processes, as do several of the *Neonymphæ*, whereas the head of *Alope* is round. The egg is quite unlike *Satyrus*, of which I have seen several species, all having been rather cylindrical, with vertical ribs. Whereas the egg of *Portlandia* is rounded and smooth, very much as *Neon. Canthus*, but more ovoidal.

In Say's time, (about 1825), this insect was known only as Southern. He says: "It has not been found so far north as Pennsylvania." Gosse, in Canadian Naturalist, p. 246, 1840, mentions seeing an example in Canada. Mr. Scudder, 1863, includes it among the butterflies of New England, but says he has seen only a single specimen from N. E. I find in my notes that it has been taken at Orono, Maine (I think by Prof. Fernald), and on Mt. Holyoke, Mass., by Prof. H. W. Parker. At the West, Lieut. Carpenter has sent it to me from Fort Niobrara, Neb. Gosse, in his Letters from Alabama, p. 122, 1859, speaks of the butterfly (under name of *Hipparchia Andromacha*) as common in Alabama, and mentions its habit of frequenting the foot of a particular tree for many successive days, and sallying out on any passing butterfly, and after performing sundry circumvolutions, retiring to its chosen spot of observation again. He regards it as particularly "social and gamesome."

Portlandia is not a very common species in this part of West Virginia, probably because we have so little open forest at low elevation, the mountains rising abruptly from very narrow strips of bottom land. It is a forest species, not being found in the open fields so far as I have observed. Apparently it must swarm in certain localities in other States. Mr. Lewis Ullrich, of Tiffin, O., wrote me August, 1881, that ten days before he had taken about 150 good specimens, and rejected many not good, in a certain piece of woods near by, stating that they seemed to be confined to this particular spot, and so far as he knew were unknown elsewhere in that county. Mr. Ullrich, at my request, made another excursion, and succeeded in obtaining a female which he tied in a bag over grass, and so got a dozen eggs for me, 3rd Sept. From these I raised five larvæ to maturity. I have myself found great difficulty in obtaining eggs of *Portlandia* by this method, and have repeatedly failed. But twice succeeded, and carried a few larvæ over winter, only to lose all before chrysalis. Except in a single case, when the larva reached 4th moult 18th Sept., and presently died, all I have bred have gone into lethargy soon after 3rd moult. But the eggs have always been laid late in the season. Two moults are passed in the spring, but probably 4 moults are all which larvæ of the summer broods require. I have taken the butterfly, in different years, as early as 18th May, and through each month to 1st Sept., and I apprehend there are three annual generations here, the first in May, the second middle of July, the third late in August, as I have taken fresh examples at these times. Say describes the caterpillar briefly, thus:

"The caterpillar is downy and bimucronate behind." And the chrysalis: "The pupa is suspended by the tail; it is angulated, bimucronate on the front." Mucronate means in his glossary "terminating in a sharp point." That will do for the caterpillar, as it is tailed, but the chrysalis is wrongly described, its head case being square, without sharp points, or processes. Bois. and Lec. give a very fair representation of the chrysalis after Abbot, but the caterpillar is badly done, the head and its processes being quite out of drawing. Boisduval's description is drawn from the figure, not from nature, and of course is wholly incorrect, and he remarks that the two points which surmount the head spring up in the form of ears (*s'élevéut en forme d' oreilles*), as indeed they do, funnily enough, in the cut. The face is as that of a grasshopper, and the "ears" are as of a kangaroo, and the whole thing foreshadows a "gamesome and frolicsome" butterfly.

ON THE APHIDIDÆ OF FLORIDA, WITH DESCRIPTIONS OF NEW SPECIES.

BY WM. H. ASHMEAD, JACKSONVILLE, FLA.

(*Paper No. 3.*)

Section SIPHONOPHORINI.

Genus SIPHONOPHORA, Koch.

The species of this genus already described from North America are as follows:

1. *S. rudbeckiæ*, Fitch.
2. "*ambrosiæ*, Thomas.
3. "*rosæ*, Reaum. A variety of this species I find here on cultivated roses and on the wild Cherokee rose. It differs very considerably from Prof. Thomas' description, and may be known as *S. floridæ*.

I submit following description:

S. rosæ, var. *floridæ*, n. s.

Wingless female.—Length .07 inch. Elongate ovate; pale shining green; eyes red; beak very pale and short, not reaching to middle coxæ,

widening before tip, tip black; antennæ 7-jointed, reaching to base of honey-tubes, annulated with brownish-red at joints; honey-tubes long, reaching beyond tip of abdomen, pale greenish, very slightly infuscated at tip; style short, conical, pale green; legs uniform pale green, feet very slightly infuscated.

Winged individual.—Length .06 inch. Elongate ovate and shining green. Vertex of head reddish; eyes brown; antennæ reaching beyond tip of abdomen, dark brownish black, excepting basal joints, which are pale; thorax shaded with brown; abdomen pale; legs pale greenish yellow, knees black; wings hyaline, veins greenish yellow, discoidal vein black.

4. *S. avenæ*, Fab.
5. "*viticola*, Thomas. First detected here early in March on wild grape vines growing in our swamps; later it becomes quite common on cultivated vines.
6. *S. setariæ*, Thos.
7. "*euphorbiæ*, Thos.
8. "*euphorbicola*, Thos.
9. "*asclepiadis*, Fitch. Very common here in early spring on *Asclepias cornuti*.
10. *S. erigeronensis*, Thos.
11. "*cereopsis*, Thos.
12. "*lactucæ*, Linn. Occasionally found here on lettuce.
13. "*polygoni*, Walker.
14. "*salicicola*, Thos.
15. "*verbenæ*, Thos.
16. "*rubi*, Kalt. Rarely found in early spring on under surface of leaves of *R. villosus*.
17. *S. pisi*, Kalt.
18. "*gerardiæ*, Thos.
19. "*heuchera*, Thos.
20. "*cucurbitæ*, Thos.
21. "*tanacetii*, Linn.
22. "*fragariæ*, Koch. Var. *immaculata*, Riley.
23. "*menthæ*, Buckton.
24. "*absinthii*, Linn.
25. "*achyrantes*, Monell.
26. "*calendulla*, Monell.

27. *S. tulipa*, Monell.
28. "*crataegi*, Monell.
29. "*sonchi*, Linn. Syn. *sonchella*, Monell.
30. "*calendulae*, Monell.
31. "*tiliae*, Monell.
32. "*liriodendri*, Monell.
33. "*prunicola*, Ashmead, Pacific Rural Press, 1881.
33. "*citrifolii*, Ashmead, Orange Insects. p. 65, 1880.

DIMORPHISM AMONG THE SIPHONOPHORA.

For many years dimorphism, viviparousness and parthenogenesis among insects have attracted universal attention. Not only from the fact of the rarity of their occurrence, when we take into consideration the countless insect hosts of varied forms, sizes and colors that constitute what may be termed the insect world; but to the biologist, the naturalist and the philosopher, they are of the most profound and absorbing interest as bearing upon some of the great unsolved questions of the day. A careful study of the economy of any one of the billions of animated forms that exist around us, will certainly unfold some hidden truth, give a glimpse, or reveal some knowledge of that mysterious, omnipotent and almost unknowable force pervading the universe. And will not facts derived from these studies enable mind—the supreme, the attainable—to grasp truths unattainable without them? Since Darwin's wonderful revelations in regard to earthworms, I have had the profoundest respect for them; and as I pass on my way to my business in the early morning and turn up with my foot their dwellings, disclosing their tortuous night work, I feel like bowing to them and saying: Oh, wonderful earthworm! You, too, are worthy of respect and admiration; for hast thou not during countless cycles of ages been helping to build up and beautify the universe and render it a fit habitation for man!

The subject under consideration has had the closest attention from some of the more thoughtful students of Entomology in this country, as well as in Europe. America may well feel proud of her investigators in this particular field of research, among whom may be mentioned Benj. D. Walsh, discoverer of dimorphism among the Cynipidæ; H. F. Bassett, who so ably continues the studies and adds to the discoveries respecting the habits of this family, since Walsh's death. We younger Entomologists may well imitate the example of W. H. Edwards, whose very thorough

and able investigations and experiments with the diurnal Lepidoptera have thrown such a flood of light on dimorphism and what really constitutes "a species;" and last, but not least, Prof. C. V. Riley's similar discoveries among the Phylloxeræ and Pemphiginæ. All have done much towards elucidating the vexed question.

Among the Aphididæ proper, although it has often been suspected in America, no recorded instance of dimorphism among them, that I am aware, exists. The discovery of its occurrence in the Orange Aphis, *Siphonophora citrifolii*, described by me in my pamphlet on "Orange Insects," in the fall of 1880, therefore is of great interest, and no doubt will prove such to many readers of the CAN. ENTOM.

From observations made this year I find that from an egg laid by a fall oviparous female hatch the brown-black and black winged male and winged viviparous female, which I describe as follows:

Young. —Length .02 inch. Dark greenish brown, with dark eyes and glassy white antennæ and legs.

♂. —Length .04 inch. Color brown and brown-black; antennæ brown, legs pale or yellowish, posterior femora slightly shaded above with brown or black; feet reddish; nectaries shorter than in female; wings hyaline, stigmal spot pale.

These are rare among the first broods, and afterwards almost or entirely disappear.

♀ Apterous. —Length .05 to .06 inch. Broadly ovate. Dark brownish black. Head between antennæ reddish; antennæ 7-jointed, pale yellowish, apical ends of joints 3, 4 and 5 brown, 6th shortest, 7th long, setaceous; legs pale yellow, latter two-thirds of femora brownish or blackish, tips of tibiæ and claws brown; nectaries slightly thickest at base, black and cylindrical; cauda distinct.

♀. Winged viviparous. Length .06 inch. Color black and shining; eyes red-brown, tubercles of antennæ black, vertex of head reddish; rostrum reaching back of middle coxæ; antennæ not quite reaching to tip of abdomen; abdomen variable, brown-black, brown or olive-green; nectaries long, cylindrical and black; cauda long and recurved, dark; wings hyaline, stigma rather broad, brown, obliquely sharpening to a point at outer edge towards apex; stigmal vein strongly curved, three oblique veins, the third forked; hind wings with two oblique veins, in some specimens but one.

I have watched these viviparous females breed on my orange trees, and the rapidity with which this is done is simply astonishing. In a few days broods upon broods, or young colonies, seem to exist on all the tender new leaves and shoots, and still the parthenogenetic young keep coming. Verily, if it were not for the chalcid flies, ichneumons and other parasites, they would be the death of the trees. By the middle of March a change takes place in the broods. The young differ from their parents in shape, color and size! So different are they as to discredit belief, and had I not watched them breeding day by day on my orange trees, I should have felt justified in describing them as a distinct species. They are undoubtedly a dimorphic form, and I give below a description:

Dimorphic, viviparous, apterous female.—Length .08 to .09 inch. Elongate; color a uniform pale pea-green, with more or less of a longitudinal shading of a darker green on dorsum, with the surface more or less corrugated; eyes bright red, with a prominent facet or ocellus springing out from hinder edge of same, giving it a toothed like appearance; antennæ 7-jointed, pale glassy green, in mature specimens the tip from 5th joint is reddish; legs of the same uniform pale green, with only feet red; abdomen at tip somewhat pointed; nectaries very long and thin, slightly curved, slightly swollen in middle, and pale green; cauda small, conical. Beak does not quite reach to tip of middle coxæ.

The winged form agrees in every respect with above description, and can only be distinguished by having wings, the veins of which are very pale. These are rare, the majority being wingless.

The mature viviparous female continues breeding and can often be found surrounded by from 20 to 30 pale green young; occasionally a brown one will be found among them. These continue breeding for several generations, ultimately giving place to the original type, and by the last of April none can be found. Why this change of form occurs is yet a mystery, and needs further investigation. Towards the end, all seem to be parasitized by a *Trioxys*, *T. testaceipes* Cresson, which thoroughly eradicates them.

34. *S. solanifolii*, n. sp.

Wingless female.—Length .12 inch. Elongate ovate and of a pale yellowish green color; beak short, not reaching middle coxæ, pale, tip black; antennæ 7-jointed, slightly reaching beyond abdomen, situated on large tubercles, pale greenish, joints infuscated, 6th joint shortest, dark,

7th longest, brown; eyes red; honey tubes very long, reaching considerably beyond abdomen, slightly thickened at base, infuscated at tip; style short, conical, greenish; coxæ shining and yellowish, feet black.

♂. Length .05 inch. Black. Beak reaching to middle coxæ, apical half black; antennæ black, hardly reaching to middle of abdomen; honey tubes rather short, black; all coxæ black, anterior and middle legs pale greenish, tips of tibiae and feet black, posterior pair, excepting apical half of femora, which is greenish, brown.

Only two males were secured out of hundreds of apterous individuals, and these are remarkable for being so much smaller than the females.

Found feeding on the Pepper Vine, *Solanum jasminoides*.

THE HOP-VINE BORER.

BY CHARLES R. DODGE, WASHINGTON, D. C.

The casual reader, calling to mind only the half dozen hop-vines usually seen about the kitchen garden, or trailing upon some farm out-building, can hardly realize the possible losses to hop growers by insects. According to the last census (for 1879) New York State alone had over 39,000 acres in hop yards, producing nearly 22 millions of pounds of hops, which, at an average of 28c. per lb., would aggregate a value of over six million dollars. Bearing these figures in mind, with an annual loss of 10 per cent. from only one insect—the hop borer—and 25 to 50 per cent. of injury has been reported) a loss of \$600,000 would result in this single State.

With such a destructive agent in the hop field, is it not a little singular that there is little or nothing "in the books" on the subject, and that the pest is in all probability an unknown and undescribed species? I am not able to give its name—Prof. Comstock writes me he is working it up—but as I have accumulated a mass of interesting data on the subject in my census work, I deem it proper to make known now the experience of intelligent growers in different sections of the country, for the benefit of those who have not yet learned how to fight the pest, leaving the scientific name and details of habits and natural history to be supplied hereafter.

The only mention that I can find of an insect boring into the crown of the hop plant, in the manner set forth by my numerous correspondents,

occurs on page 33 of the Report of the Entomological Society of Ontario for 1872, by Rev. C. J. S. Bethune. As an appendix to his paper on Hop Insects, he gives descriptions of an unknown larva feeding "upon the crown of the root," and which he was unable to rear. The size of the larvæ and the general points of description agree so well with the unscientific descriptions given by my correspondents, the growers, that I unhesitatingly pronounce them to be the destructive hop borers, which are the subject of this paper.

The pest has been known to cultivators of the hop for many years—indeed it is reported from Oneida county that it has always been known in the locality—and other hop growing districts have felt its presence for longer or shorter periods. In Juneau county, Wisconsin, it was first noticed in 1867, while the observer in Waupaca county had not noticed it prior to 1881. The percentage of destruction varies in different sections from almost nothing, where kept under control, or yards are new, to 25, 50, and even a greater percentage where the yards are old, badly infested, or not looked after. These facts lead a New York grower to state, in his opinion, that it is best to abandon yards after six or eight years' culture, and change to new ground, for "grubs will get into a yard after two or three years, gradually increase, and in eight or ten years spoil the yard." Other growers contend that only the yards of the ignorant and shiftless are ever damaged to any extent by the borer.

I shall not attempt to give a description of the larva here further than to say that all correspondents agree in the statement that it is an inch and a quarter to an inch and a half in length, and three-sixteenths to one-fourth inch in diameter at maturity, whitish or light gray in color with a dark head.

As soon as the vines start from the ground in May and June, and when but a few inches high, the mother insect begins the attack by depositing her eggs upon them. The subsequent injury is thus described by Mr. Pierpont, a large grower of Ontario county :

"The warm sun hatching the egg deposited in the head of the hop vine, soon after it is out of the ground, it soon becomes a lively worm about one-fourth of an inch in length, subsisting upon the sap of the vine. It leaves the head of the vine soon after hatching, enters the ground, bores to the centre of the vine and works up an inch or two, finally locating where the vine starts from the crown, eating at this point and at the crown until the vine is nearly or quite destroyed, and the crown weakened by water getting in, causing decay, and finally the destruction of the entire hill."

Another report states that the insect begins work in the latter part of June by eating into the tender vines where they start from the old crown or bed root ; and unless prevented, will eat the vine entirely off, thus destroying the crop ; " many times they poison the root so that the whole hill dies." Old yards die from this cause more than any other, as the borer prevails more in old than in newer ones.

Another grower states that the damage commences about the last of May or first of June, when " the head of the vine will appear slightly bent or curved, if compared with sound ones. The grub, after feeding a little time in the heart of the head, drops to the ground and makes its way into the heart of the vine below the surface of the ground, working deeper as it grows larger. The vine wilts and finally dies."

There is great diversity of opinion among growers as to the best means of ridding a yard of these pests. A few take for granted that there is no remedy, leaving the skunks to carry on the warfare alone ; and right here it may be stated that growers east and west speak most favorably of the friendly offices of this much despised animal, in the hop yard. Salt is mentioned by many growers as a remedy. It is put on after the vine has become somewhat toughened, from middle to last of June, salt on the tender new stalks killing them in a short time. Lime, ashes, sulphur, &c., are also recommended, but doubtless do little real good. Some growers emulate the skunks by digging out the grubs, often doing more damage than the pests themselves.

Mr. Pierpont says an experienced tyer of hops can tell at a glance the head containing a worm, which is crushed in an instant, but this process can only be practiced for a few days, as the worms leave the head soon after hatching. Next to the crushing process a useful remedy is to hill the hops as soon as possible and give the yard thorough cultivation. The hilling causes fibrous roots to put out above the operations of the grub and save to some extent the crop.

The most detailed statement of experience, and it seems to me the best remedial agency or means of prevention, is furnished by Mr. J. F. Clark, a grower of Otsego county, New York, who writes as follows :

When the vines are well up the poles, and at the first hoeing about the last of May or first of June, the dirt should be carefully worked away from the vine by the hoe ; all the dirt remaining between the vines must be carefully worked out with a sharpened stick, so that all the vines will be left bare as low down as where they leave the bed root ; thus they become

toughened by the weather and are not so attractive to the grub. Immediately after this operation, a good handful of the following compost should be applied directly around the root and vine: Take equal parts of salt, quick-lime and hen-manure; place the lime on the floor first, and throw on, water enough to thoroughly slack it; immediately spread the salt on top, following with the hen-manure. When the lime is well slacked, mix the whole thoroughly, and in a couple of weeks it will be ready for use, as above. Do not hill up the hops until the latter part of July or first of August, and the yard will not suffer any from grubs, but will remain clean and free from weeds the remainder of the season. When yards are hilled earlier than stated above, the grub sometimes works in them more than in late hilled ones.

To return to the skunks. They seem to have acquired the digging-out process to perfection—far better than the hop grower—as they are able to dig around the hills without the least injury to the vines. In Juneau county, Wisconsin, this little fellow—with an appetite for juicy grubs only equalled in degree by the pungency of his perfume—is the only positive remedy, as he works about the hop-hills or roots, cleaning out the worms in a few nights. One grower says: "I have seen ten acres where not a dozen hills would escape their little noses."

It is worthy of note that in a majority of cases the growers report the borer as the most injurious insect in the hop yard, not excepting the hop-aphis.

LEAF-MINING ANTHOMYIDÆ.

BY J. A. LINTNER, ALBANY, N. Y.

Among our American species of Anthomyidæ, none have hitherto been known as leaf-miners. Several are depredators on the roots of garden vegetables, as indicated by the specific names of *Anthomyia ceparum*, *A. brassicæ* and *A. raphani* (the onion fly, cabbage fly and radish fly); some occur in excrements, and one, a few years ago, was discovered as preying upon the eggs of the Rocky Mountain locust. During last year and the preceding a species (*A. cæ*) which had been almost unknown since its publication in 1860, has been seriously damaging the leaves of beets, in England, by mining them in tortuous channels and large blotches,

causing them to shrivel, dry up and die. In two counties alone, 1,624 acres of mangolds were infested (Ormerod). This last summer some *Anthomyia* larvæ were discovered by me in Middleburgh, N. Y., extensively mining the leaves of the garden beet (*Beta vulgaris*). Judging from published descriptions and figures, I believed it to be identical with the European species of the same habits, and that it had been a recent importation thence. Examples of the eggs, larvæ, puparia and flies were sent by me to Mr. R. H. Meade, of Bradford, England, who has been recently making special study of the Anthomians, and particularly of the North American species, as may be seen in a paper in the March number of the last volume (xiii) of the CANADIAN ENTOMOLOGIST, giving the result of his study of the collections in this family, belonging to the Museum of Comparative Zoology at Cambridge, Mass. Mr. Meade finds, among the examples which I sent to him, reared by me from my larval collections at Middleburgh, no less than three distinct species—all differing from *A. beta*—two believed to be undescribed—and one identified as *Chortophila floccosa* Macq. It seems somewhat remarkable that all these should have been obtained from larvæ feeding at the same time, upon a small garden bed of beets, containing about fifty square feet of surface. The description and general history of the new species will probably be given in my forthcoming Annual Report.

• NOTES ON ISOSOMA ELYMI, FRENCH.

BY G. H. FRENCH, CARBONDALE, ILL.

In my notes in the March number of the CAN. ENT., the idea is conveyed that this species obtained from the wild Canada rye grass, may prove to be identical with the wingless form obtained by Prof. Riley and myself from wheat stalks, and which Prof. Riley has since named in the American Naturalist, *I. Tritici*. At the same time doubt was expressed as to their identity, because at the time of writing there were still larvæ in the grass straws, while *I. Tritici* pupated in the fall, both in the breeding jars and in the field. Since the article mentioned has appeared, I have

obtained from my grass stalks several more specimens, and I believe the two forms to be entirely distinct. A specimen was sent to Prof. Riley, upon the receipt of which he wrote as follows:

"It is undoubtedly distinct from *I. Tritici*, as is shown not only by the greater length, stouter body, darker color of the antennal scape and constancy of the winged form, but also by the punctuation (most markedly), by the shape of the mesothoracic scutum, and by the color of the meso-scutar parapsides. It comes in fact nearer to *Hordei* than to *Tritici*, though, as you say, it is well distinguished from the former by the punctuation."

Five specimens were obtained. These measured: two .12, one .14 and two .15 of an inch in length, and all were winged females, the male not being as yet known. The body robust, much like *Hordei*, the head and thorax rather coarsely punctured, but less so than in *Hordei*. The scape of the antennæ black, the rest brownish black; legs black, the articulations and feet, except the last joint, tawny, the tibiæ scarcely lighter than the femurs and trochanters. Spot on side of prothorax and tips of ovipositor tawny. This is less hairy than *Tritici*, more in that respect like *Hordei*. It may be stated here also that it differs from *Hordei* in the place where the larvæ are found, these being on the interior of the culm in the central hollow, and making no galls, while the larvæ of *Hordei* are found in galls in the outside tissue of the culms.

CORRESPONDENCE.

THE DEVELOPMENT OF A LUNA.

DEAR SIR,—

On the evening of the 12th of April, being at the residence of Mr. J. Johnston, a noise proceeding from his hatching box attracted his attention. Upon looking for the cause, he found a Luna just emerged, the fifth from a batch of nine cocoons which he had raised from the egg. Its body and wings seemed to be quite dry, and were a pure downy white, with the exception of the costal band, which appeared disproportionately

large, and a minute dark speck for the eye spot. It was remarkably active and did a great deal of rapid travelling before it came to rest, which it did at last quite suddenly on the end of a twig, and then never moved except to better secure its foothold. Mr. Johnston placed it in a suitable position under the full light of the lamp, that we might watch its progress to maturity. The first change noticed was the appearance of a bright green spot near the base of the front wing, and as that enlarged the wing expanded, very slowly at first, but more rapidly as it increased in size, the green coloring matter flowing along between the upper and under membrane of the wing, becoming more delicate in its shade as it spread first along the front of the wing, and had reached the apex before it extended through the inner half; but by the time it had touched the extremity of the whole outer angle the size, form and color of the wing were complete.

In the meantime the hind wing had not yet doubled its original size, with the part from which the tail was to come showing as a slight break on an otherwise even edge; the same routine was followed in the development of the hind wing as in that of the front, and by the time the broad part of the wing had attained its full size, the tail was a little more than half an inch long and very much crumpled. This was the last part to expand, but as the fluid passed into it, it also took size and form. The whole time occupied in the operation, from first seeing it until it was completed, was about one hour and three quarters.

J. ALSTON MOFFAT.

DEAR SIR,—

I send the following from my Entomological notes: October 10, 1881, I discovered a male *Pieris rapae* coupling with a female *Pieris protodice*. I placed over them a wire screen, as they were in a bunch of mustard. Next morning I discovered that the male was dead. The female soon deposited (in open day) her eggs on the mustard plants. They hatched out and a part of them moulted the second time, but they finally all perished.

On Dec. 27, 1881, and February 15, 1882, I disturbed some boards in my garden, when a female *Aletia argilacea* in each case flew out. They were captured; the first was perfect, the latter not quite fresh. As this has been the most remarkably warm winter we ever experienced in Wisconsin, it is not strange that the *Aletia* could survive. On Feb. 15th the

farmers were plowing, bluebirds, robins, meadow-larks, red-headed woodpeckers and cedar birds were numerous.

P. R. HOY, Racine, Wisconsin.

REMARKS ON THE DESCRIPTION OF *CAPIS CURVATA*, GROTE.

DEAR SIR,—

In Vol. xiv of the CANADIAN ENTOMOLOGIST, at p. 20, Mr. A. R. Grote described *Capis curvata*, n. g. et sp. As a generic description this is certainly an extraordinary specimen of incomplete work. The species might be recognized, but the genus certainly can not be from the description. Genera are supposed to be based only on structural characters, and I presume that the remarks on structure contained in the description referred to, apply to the genus. Let us see of what these consist: "Antennæ simple"—an unimportant generic character, for many of the genera have the antennæ of its species both simple, ciliate and pectinate. "Ocelli."—Considering that there are 250 or more genera to which this can be applied, this does not help us much. "Labial palpi moderately projected, 3rd article short, a little depending."—This will apply to the majority of the Deltoidæ, and to many of the other genera; how they are projected, whether curved upwards or straight, Mr. Grote does not say; neither does he state how the palpi are clothed—a very important character in the Deltoidæ. * "The form and outline of *Lisyrhypena** (? *Sisyrhypena*), but the wings shorter and broader." What form and outline has *Sisyrhypena*? Is the student expected to hunt up the description of that genus, only to find that the wings of that genus are compared with that of some other?

No one knows better than Mr. Grote the essentials of a good generic description, but he entirely omits any reference to the eyes, whether hairy, lashed or naked; there is no mention of the tibiæ, whether spinulated or not; no mention of the character of the vestiture, whether hairy or scaly, and nothing said of the tuftings, if any, or whether they are entirely absent.

There is doubt and trouble enough to assail the student in the older works, without adding to his burdens such descriptions as that of *Capis*, and expecting him to recognize it.

JOHN B. SMITH, New York.

* *Lisyrhypena* was a typographical error. It should have been *Sisyrhypena*.—ED.
C. E.

